

A dynamical systems hypothesis of schizophrenia

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The inconsistent expressions related to schizophrenia are newly structured in a recent study by researchers at the Universitat Pompeu Fabra (Barcelona), and Oxford University. Marco Loh, Edmund Rolls and Gustavo Deco have created a dynamical system framework to discuss the disorder, publishing on November 9, 2007 in the journal *PLoS Computational Biology*.

People with schizophrenia are known to have difficulty in maintaining attention, unstable thoughts, and reduced emotions. Creating a unifying and statistical model to understand these symptoms has always posed a challenge to researchers and clinicians. For this study Loh et al. developed a top-down analytical approach based on the different types of symptoms and related them to instabilities in attractor neural networks in a statistical dynamical framework.

The researchers found that a decrease in the excitatory NMDA-mediated synaptically activated receptor conductances reduces the depth of the attractor basins, therefore reducing the stability of attention in the presence of noise caused by the statistically variable firing of neurons, thus increasing distractibility. This reduced depth in the attractor basins destabilizes the activity at the network level. The cognitive symptoms of schizophrenia (like distractibility) could be caused by this attractor instability in the prefrontal cortex

Loh et al. also found that lower firing rates are produced by reducing the excitatory (NMDA) synaptic conductances, which could account in the

orbitofrontal cortex for the negative symptoms associated with schizophrenia, such as a reduction of emotions.

Decreasing both the NMDA and the inhibitory conductances results in switches between attractor states and jumps from spontaneous activity into one of the attractors. This action may cause symptoms related to temporal lobe dysfunction such as delusions and paranoia.

The dynamical framework put forth in this study may better the understanding of the symptoms of schizophrenia, therefore culminating in better treatment for those with the disorder.

Source: Public Library of Science

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